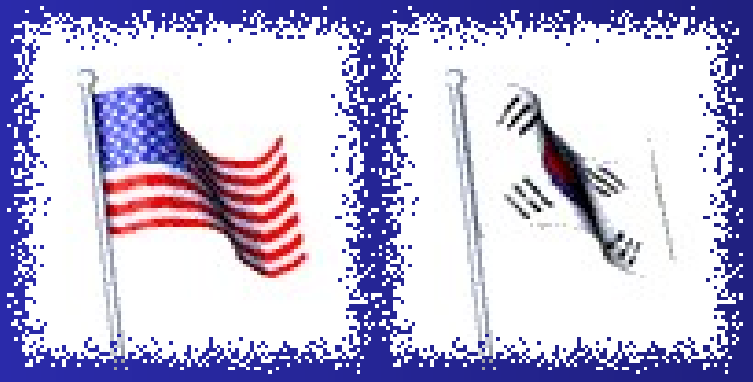
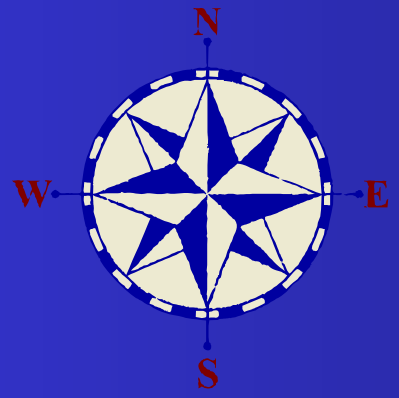
Medical Threats in the Korean Peninsula



Agenda

- Where
- Climate
- Public Health States of:
  - South Korea
  - North Korea
  - Endemic Diseases
- Militarily Important Diseases and Prevention
- Pest and Animal Threat

Where in the World is Korea?



Korea is

- Rugged and mountainous (70% of land mass), mostly along the east coast and the north central interior
- 20% suitable for agriculture
- Total Area : 220.847 Km^2 (Same as Minnesota)
  - North Korea same as Louisiana
  - South Korea same as Virginia

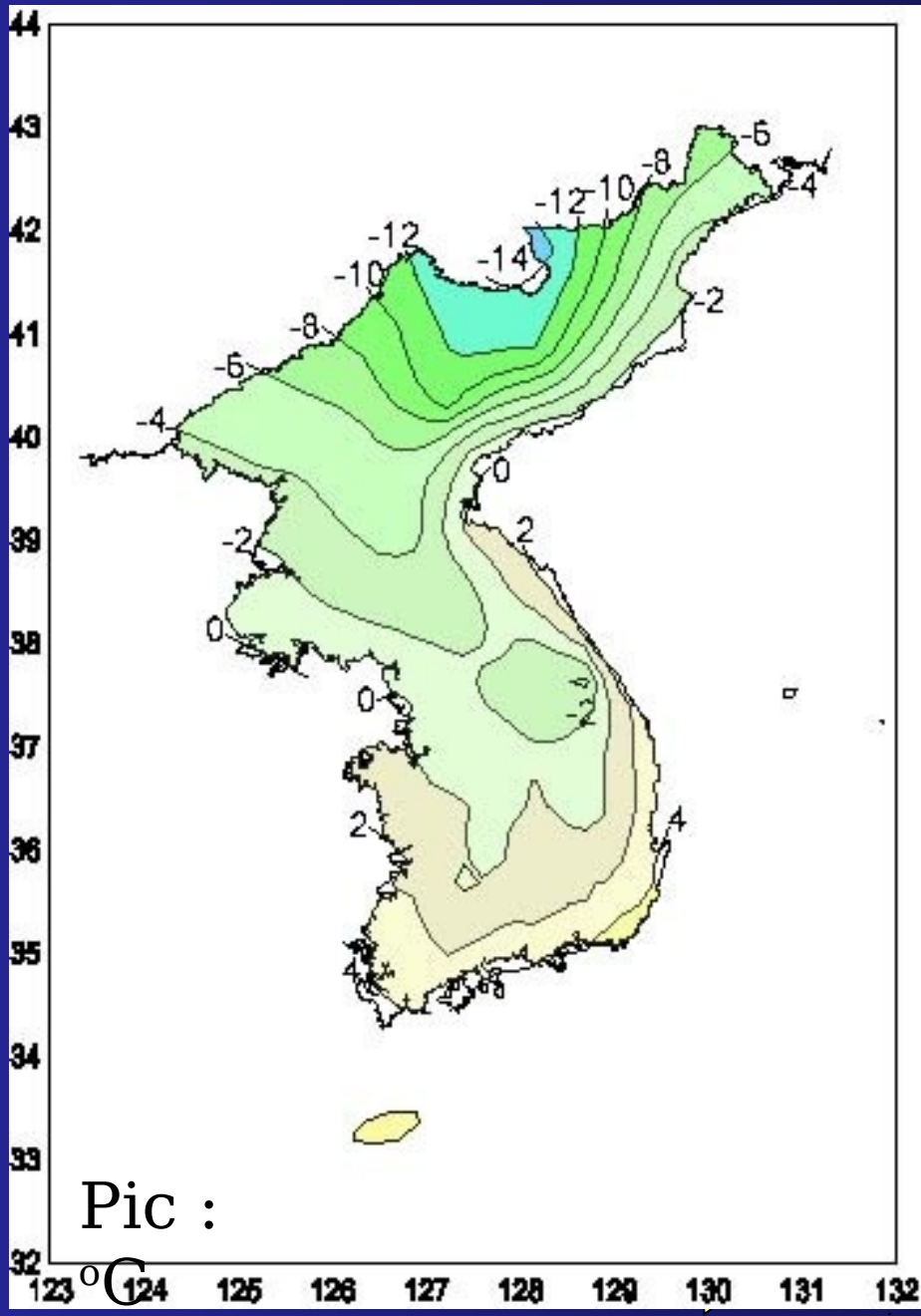
Climate

- Continental Climate
  - Very large temperature differences between seasons
- Heavy monsoon rains and typhoons
  - June through September
- 4 distinct seasons
  - Winter : cold, dry, windy
  - Spring : warm
  - Summer : hot, humid, rainy
  - Autumn : mild

Climate

Temperature

- January
  - Coldest
  - Siberian air
    - Avg : 21 ~ 45 ◦F
- August
  - Hottest
  - High humidity
    - Avg : 73 ~ 81 ◦F



Pic : °C

Climate

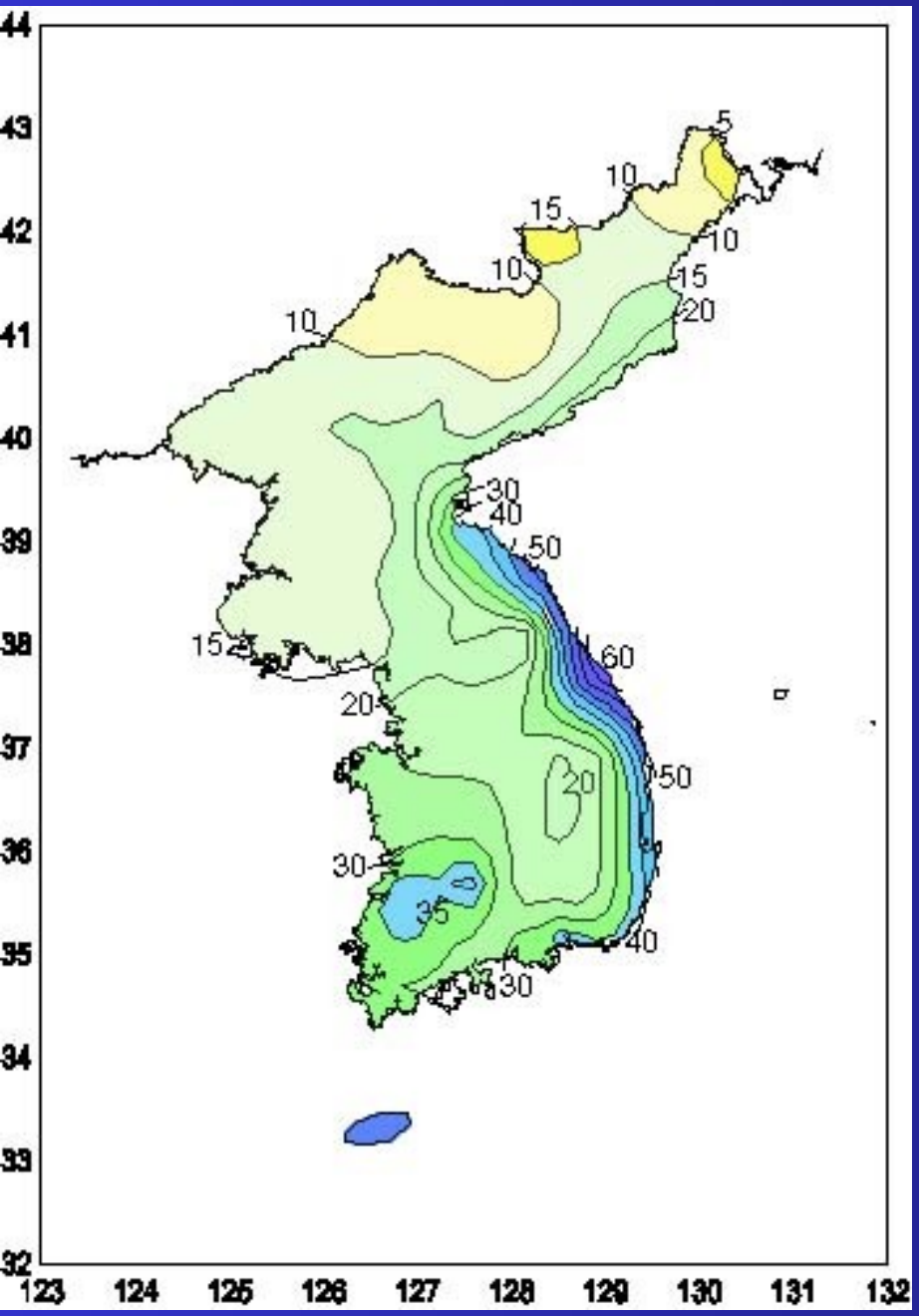
Extreme temperatures

- Coldest spot (winter)
  - Whole peninsula
    - Sam-ji-yon
    - Chung-gang-jin (yr : 73 - 94
      - Average : 3 °F on Jan
  - S. Korea
    - Chor'won
      - Extreme : -21 °F
    - Dae-kwon-ryong (yr : 200
      - Average : -2 °F
      - Extreme : -14 °F

Climate

Extreme temperatures (con't)

- Hottest Spot (summe
  - Yongchon
  - Daegu (yr : 2001)
    - Average : 68 °F
    - Extreme : 96 °F

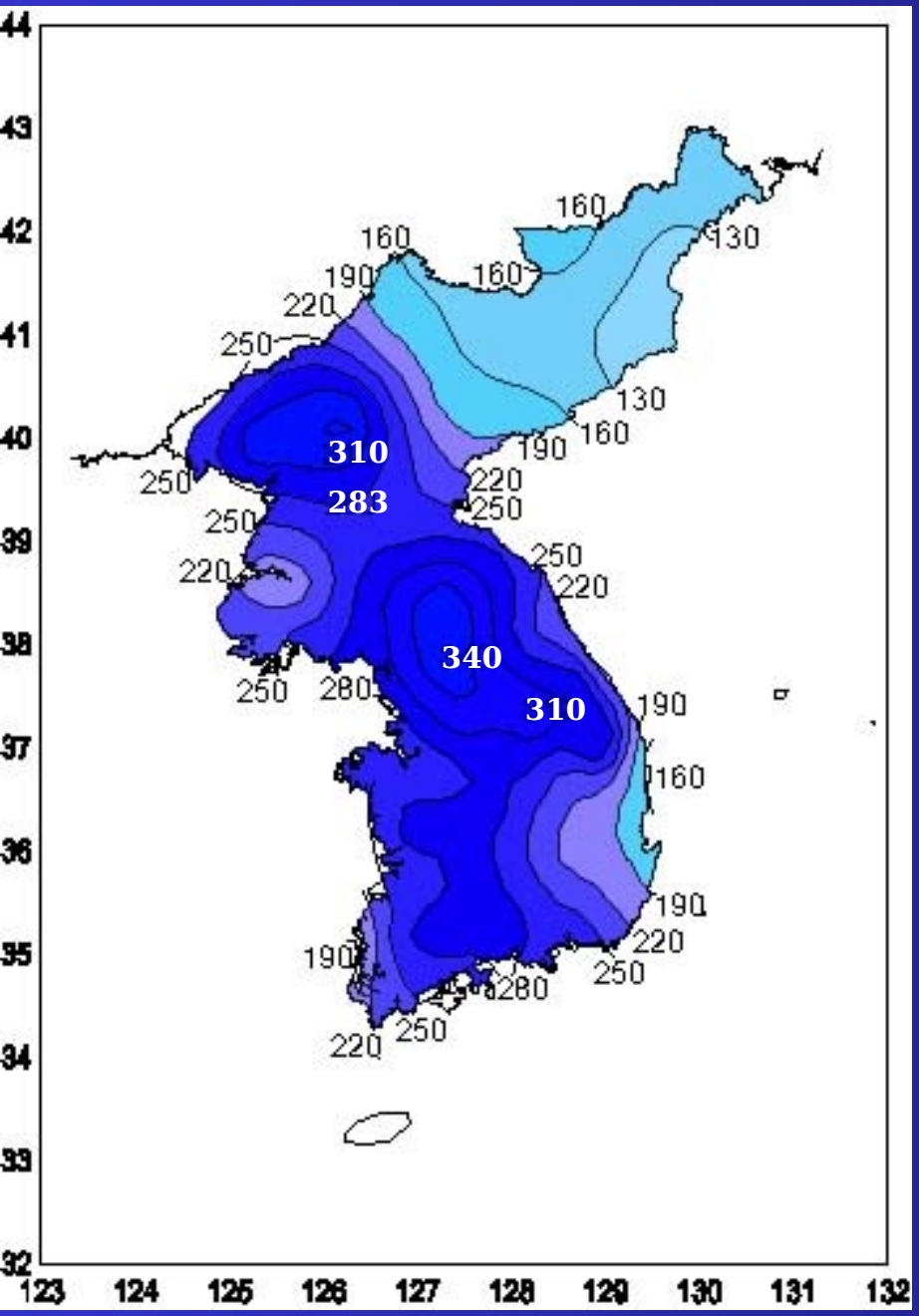


Climate

Precipitation

- Winter
  - Snowfall
  - Icy conditions
  - Drought
  - Dry air

← Average (mm) in Jan



Climate
Precipitation
(con't)

- Summer
  - 50 ~ 60 % of annual precipitation
  - 80% humidity
  - Flooding common due to heavy rains from June to August

← Average (mm) in Jul

Climate

Wind Directions

Climatic Threats

- Cold
- Heat
- Humidity
- Yellow dust
- Flood
- Typhoon

Climatic Threats

Cold Injuries

- Snow Blindness
- Frostbite
- Chilblains
- Immersion foot (Trench foot)
- Hypothermia

Climatic Threats

Heat Injuries

- Sunburn
- Heat Cramps
- Heat Exhaustion
- Heat Stroke

Climatic Threats

Humidity

- Winter dry air – Upper Respiratory Infections
- Summer humid air
  - Molds and fungi
  - Increasing Irritability Index

Climatic Threat

Humidity (con't)

- Preventive Measures
  - Low
    - Drink plenty of water
    - Humidify living space
  - High
    - Air conditioning
    - Air exchange

Climatic Threats

Yellow Dust

21 MAR 02, Seoul 23 MAR 02, Seoul

- Photo by Lee, Sung-sam, http://yellow.metri.re.kr/

Climatic Threats

Yellow Dust (con't)

- Origin
  - Deserts of China, Mongolia and Manchuria (e.g., Gobi desert and Takla Makan desert)
- Components
  - Dust (10 □) ~ sand (1000 □)
  - Pollutants from industrialization of China
    - Silicon, cadmium, arsenic, lead, copper, aluminum and other heavy metals

Climatic Threats

Yellow Dust (con't)

- Season
  - March to May
  - Extending year round
  - Lasts average of 3 to 5 days, up to 27 days
- Conveyance
  - Westerly jet stream
    - Higher than 5 km (≒16500 ft) above sea level in northern hemisphere
  - May extend to Hawaii, west coast, and central U.S.

Climatic Threats

Yellow Dust (con't)

- Health effects
  - Respiratory problems
    - Allergic rhinitis
    - Asthma
    - Upper Respiratory Infections
  - Eye problems
    - Allergic conjunctivitis
  - Other problems on mucous membranes and skin
  - Virus, Bacteria and Fungi infections
    - Foot and mouth disease

Climatic Threats

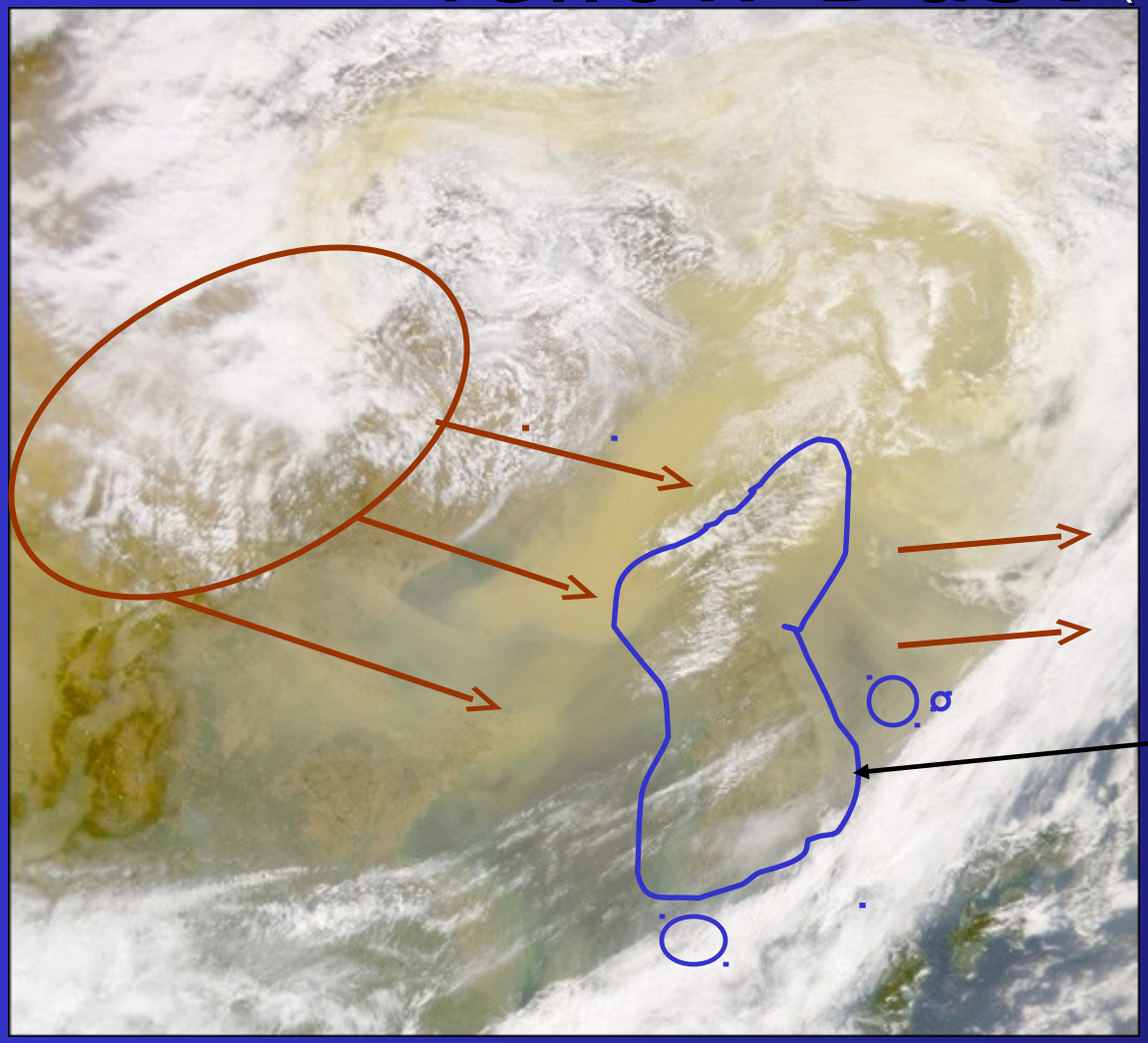
Yellow Dust (con't)

Preventive Measures

- Limit outdoor activities
- Close windows
- Wear long sleeves
- Cover mouth and nose
- Do not drink or eat food outside
- Wear glasses instead of contact lens
- Wash eyes, mouth and exposed skin after coming in from the outside
- Drink water frequently

Climatic Threats

Yellow Dust (con't)



→ Direction

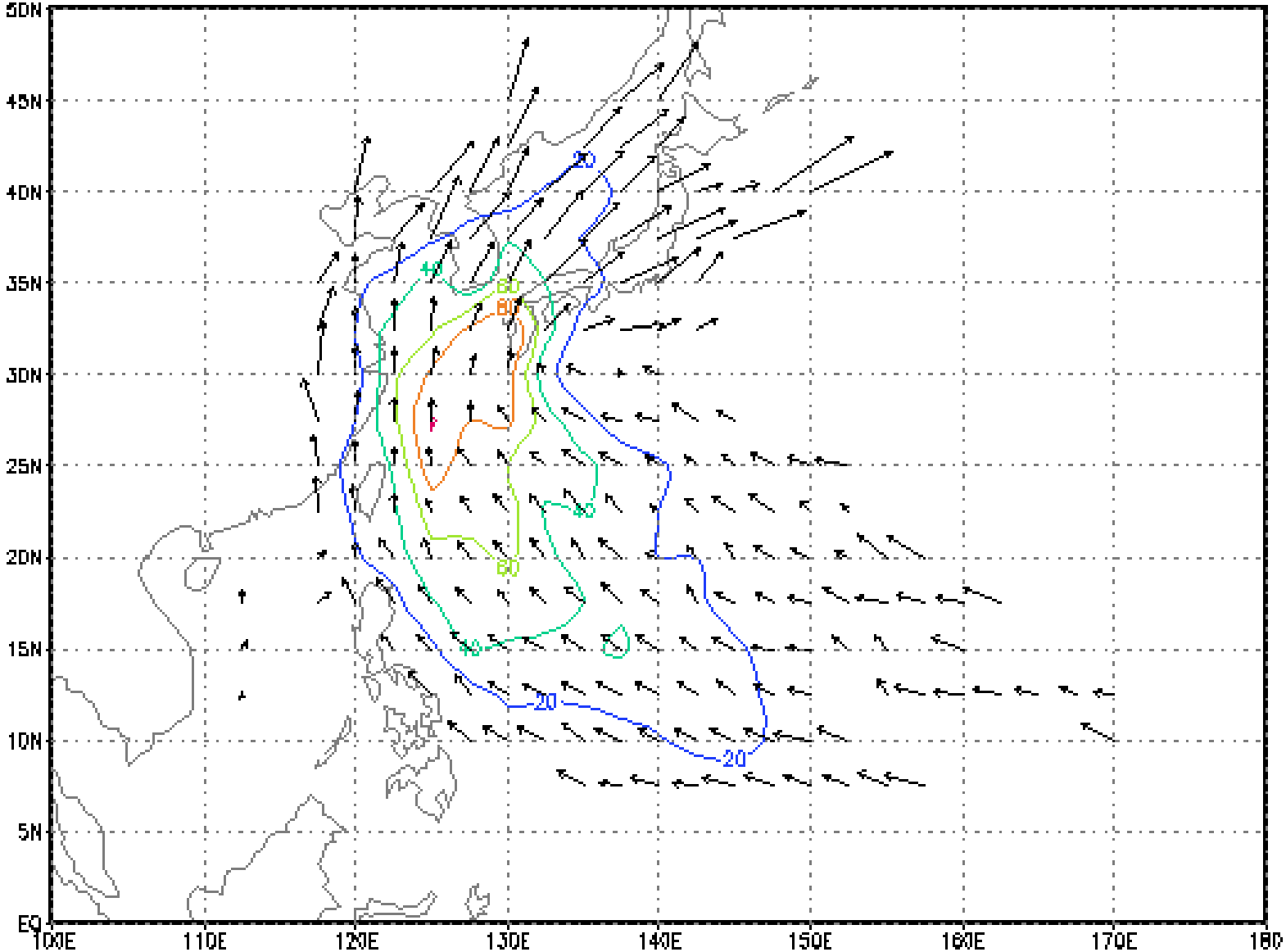
Korea

Climatic Threats

Typhoon

- 91% from JUL to SEP
- Tropical cyclone
- Tropical atmospheric depression
  - Minimum central wind velocity = 17 m/sec
  - Torrential rain
  - Strong winds

Typhoon passes and mean motion (Korean Peninsula)



Typhoon research center (http://www.typhoon.or.kr/)

Public Health States of

- South Korea & North Korea
  - Population
  - Water
  - Pollutions
  - Endemic Diseases

Public Health State

South Korea

- Population
  - 48.324 million (July 2002 est.)
- Water
  - Treated water supply : 87.1% (2000)
    - 100% at Seoul and Cheju Island
    - Over 95% at major cities
  - Daily water supply per person : 380 L (2000)

Public Health State

South Korea (cont'd)

- Pollutions
  - Air pollution in large cities and acid rain
  - Water pollution
    - Sewage, industrial effluents
    - Ground water contamination
      - Radiological isotopes
      - Other chemicals

Public Health State

South Korea (cont'd)

- Endemic Diseases
  - Notifiable diseases established by Korean National Institute of Health (KNIH)
    - Category I
    - Category II
    - Category III
    - Category IV
    - Designated diseases

Public Health State South Korea – Endemic Diseases (cont'd)

- Category I Diseases
  - Infectious diseases that require urgent investigation, control of contacts, and/or identified sources of infection
  - Immediate notification of public health centers
  - Immediate reporting to next superior jurisdiction

Public Health State South Korea – Endemic Diseases (cont'd)

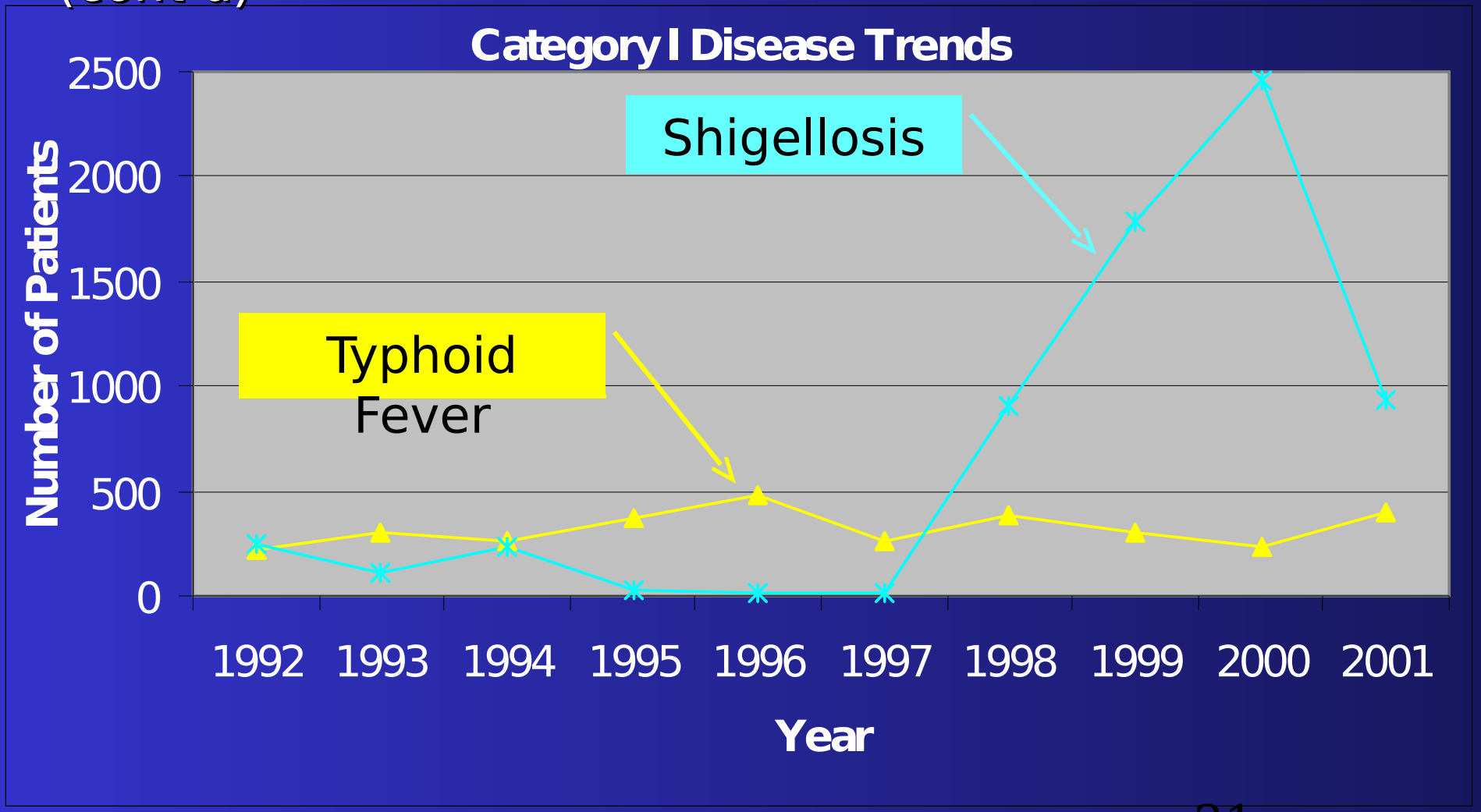
- 6 diseases
  - Cholera *
  - Typhoid fever *
  - Paratyphoid fever **
  - Shigellosis *
  - Enterohemorrhagic *E. coli* **
  - Plague

* Indicates occurrence within last 10 years

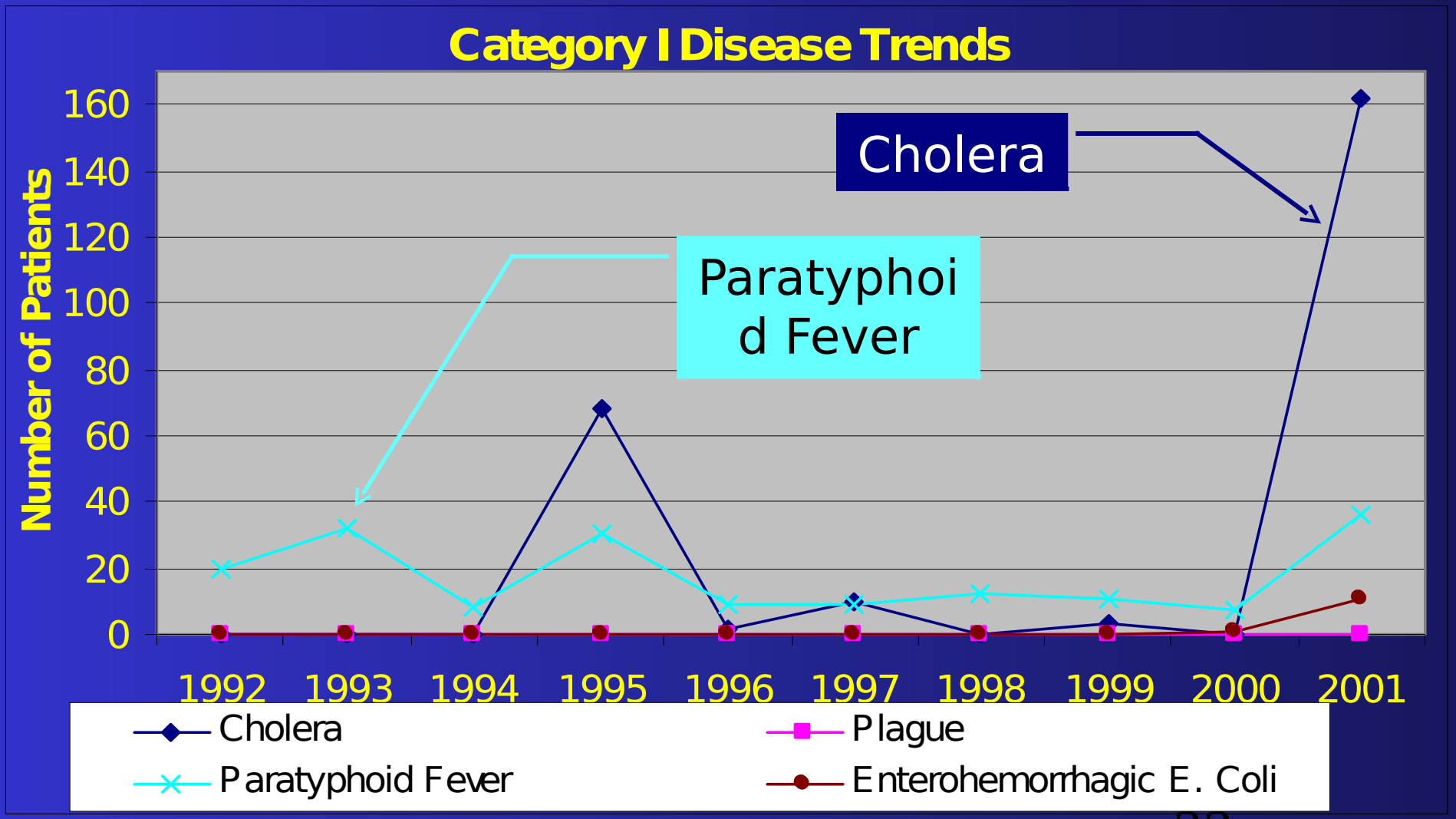
** Indicates fatal occurrence within last 10 years

Public Health State

South Korea – Endemic Diseases (cont'd)



Endemic Diseases in S. Korea (Con't)



Endemic Diseases in S. Korea

Notifiable Diseases Category II

- Infectious diseases that can be prevented by vaccination
- Immediate notification of public health centers
- Weekly reporting to next superior jurisdiction (if outbreak is suspected, report immediately)

Endemic Diseases in S. Korea (Con't)

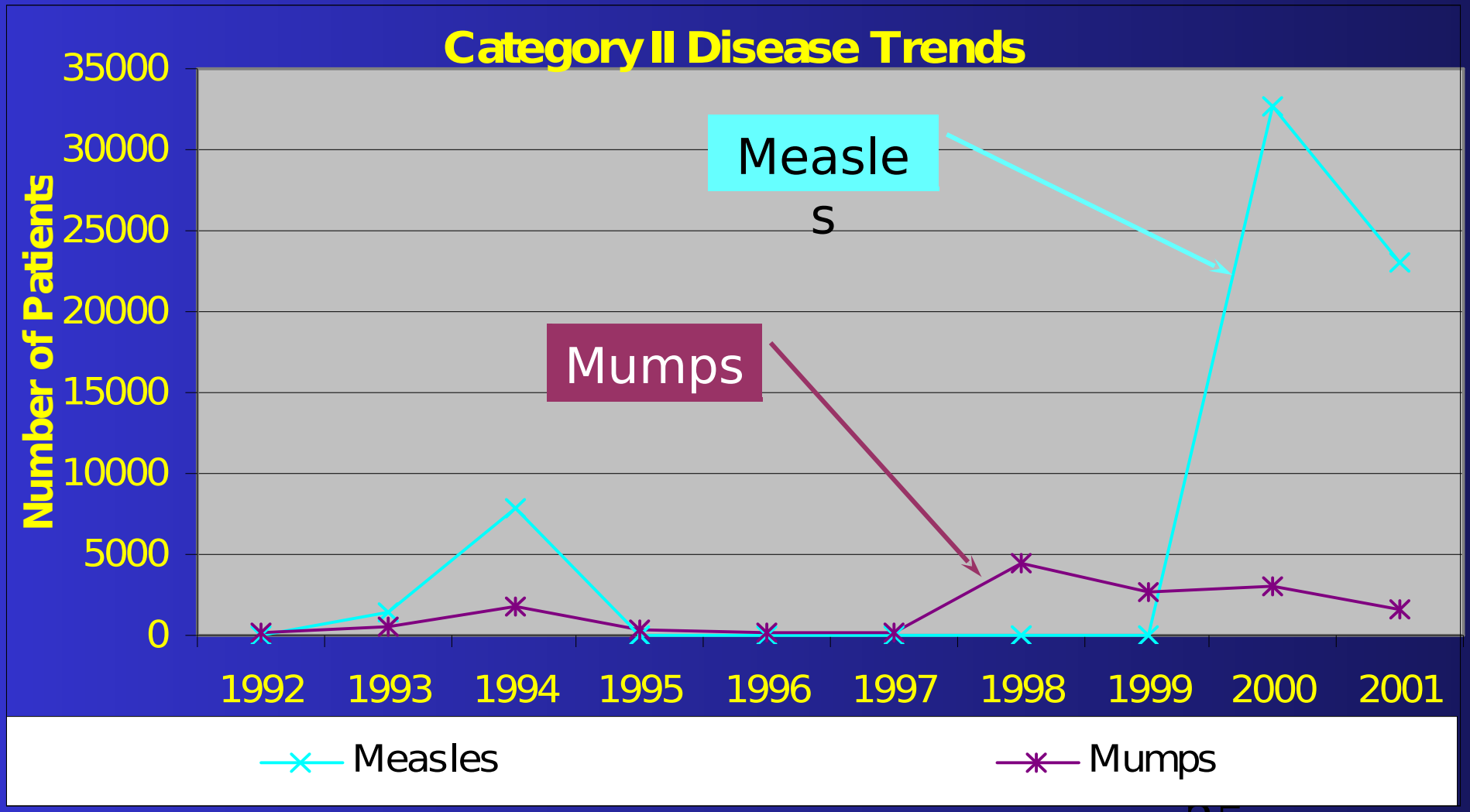
Notifiable Diseases Category II

- 9 diseases
  - Diphtheria
  - Pertussis *
  - Tetanus **
  - Measles **
  - Japanese encephalitis (JE) **
  - Rubella *
  - Poliomyelitis
  - Viral hepatitis B *
  - Mumps *

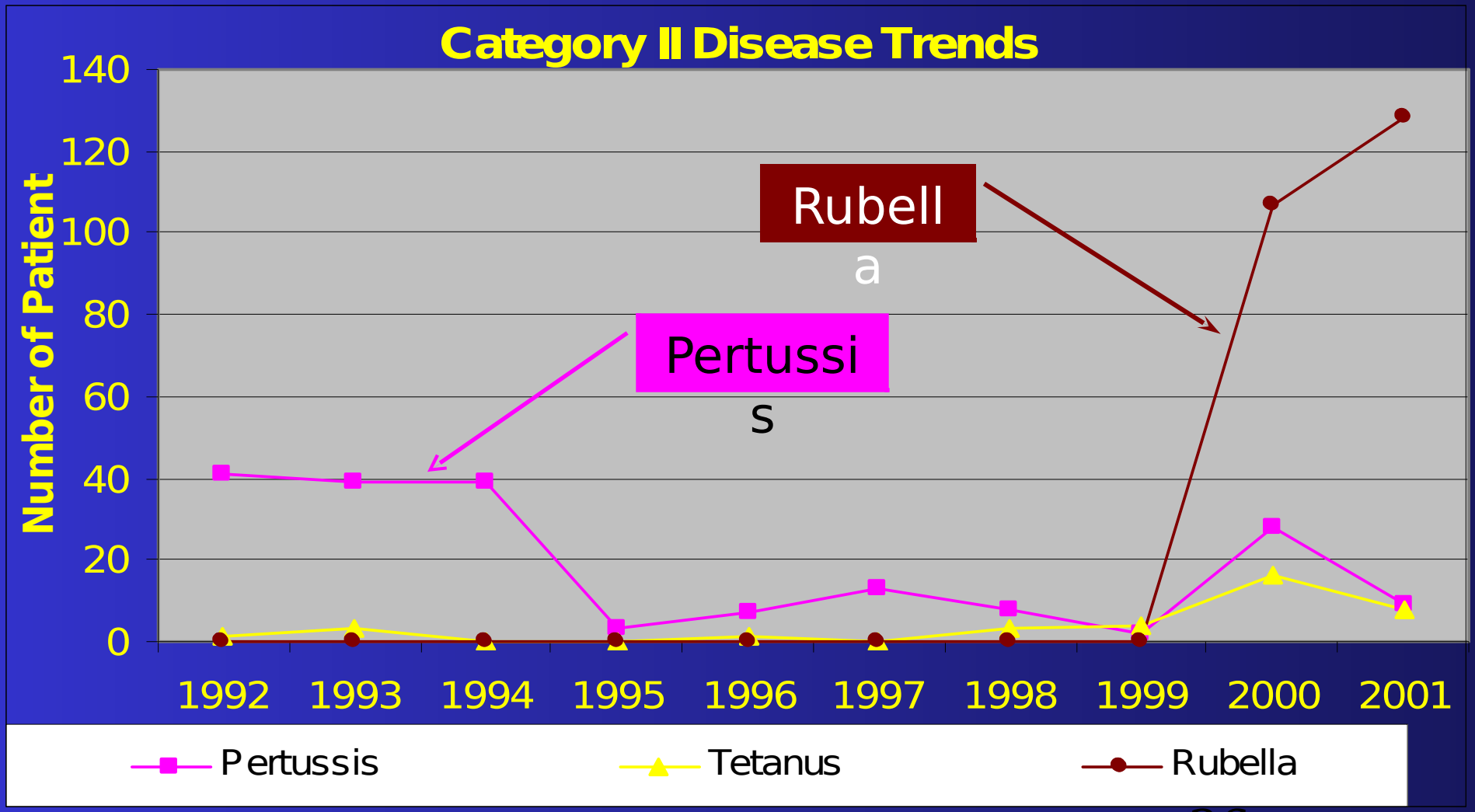
* Indicates occurrence within last 10 years

** Indicates fatal occurrence within last 10 years

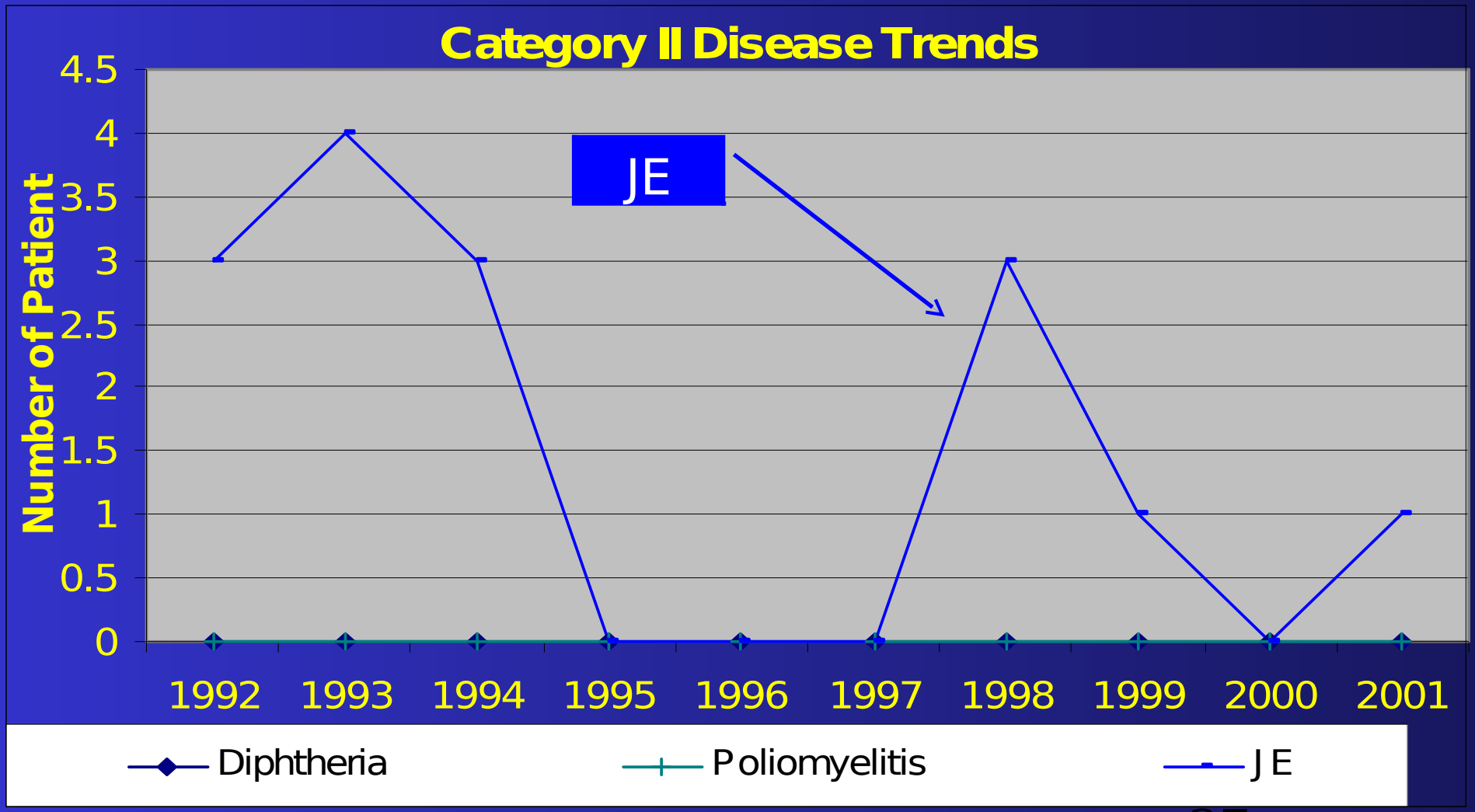
Endemic Diseases in S. Korea (Con't)



Endemic Diseases in S. Korea (Con't)



Endemic Diseases in S. Korea (Con't)



Endemic Diseases in S. Korea

Notifiable Diseases Category III

- Infectious diseases that need to be monitored consistently
- Weekly notification of public health centers
- Weekly reporting to next superior jurisdiction

Endemic Diseases in S. Korea (Con't)

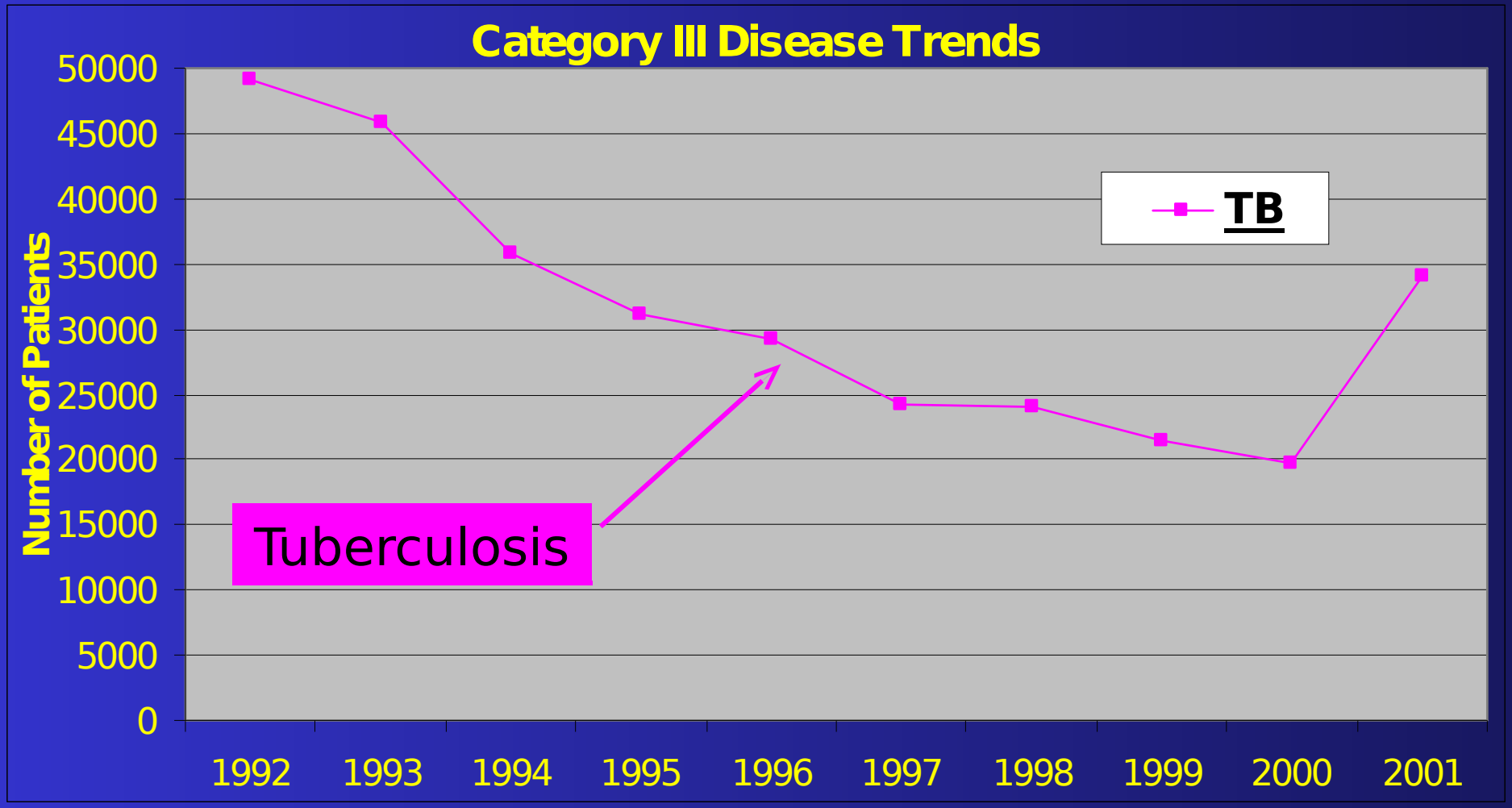
Notifiable Diseases Category III

- 18 diseases
  - Malaria ** - Murine typhus *
  - Tuberculosis * * - Scrub typhus **
  - Epidemic typhus - Leptospirosis **
  - STDs * - Brucellosis
  - Scarlet fever * - Anthrax
  - Meningococcal meningitis ** - Rabies **
  - Legionellosis * - Influenza *
  - Vibrio vulnificus sepsis ** - AIDS **
  - Hansen's disease(Leprosy) **
  - Hemorrhagic fever with renal syndrome (HFRS) **

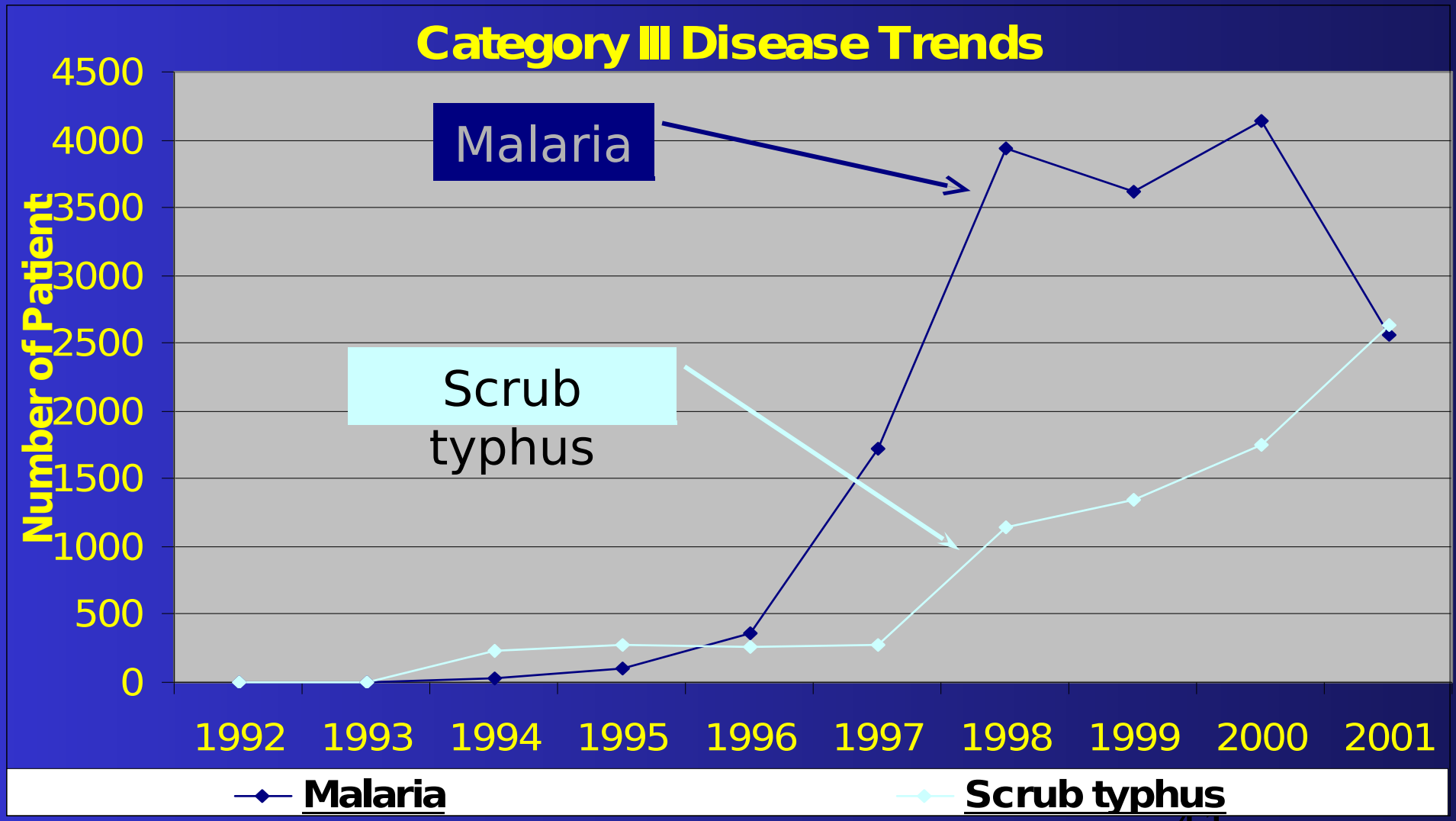
* Indicates occurrence within last 10 years

** Indicates fatal occurrence within last 10 years

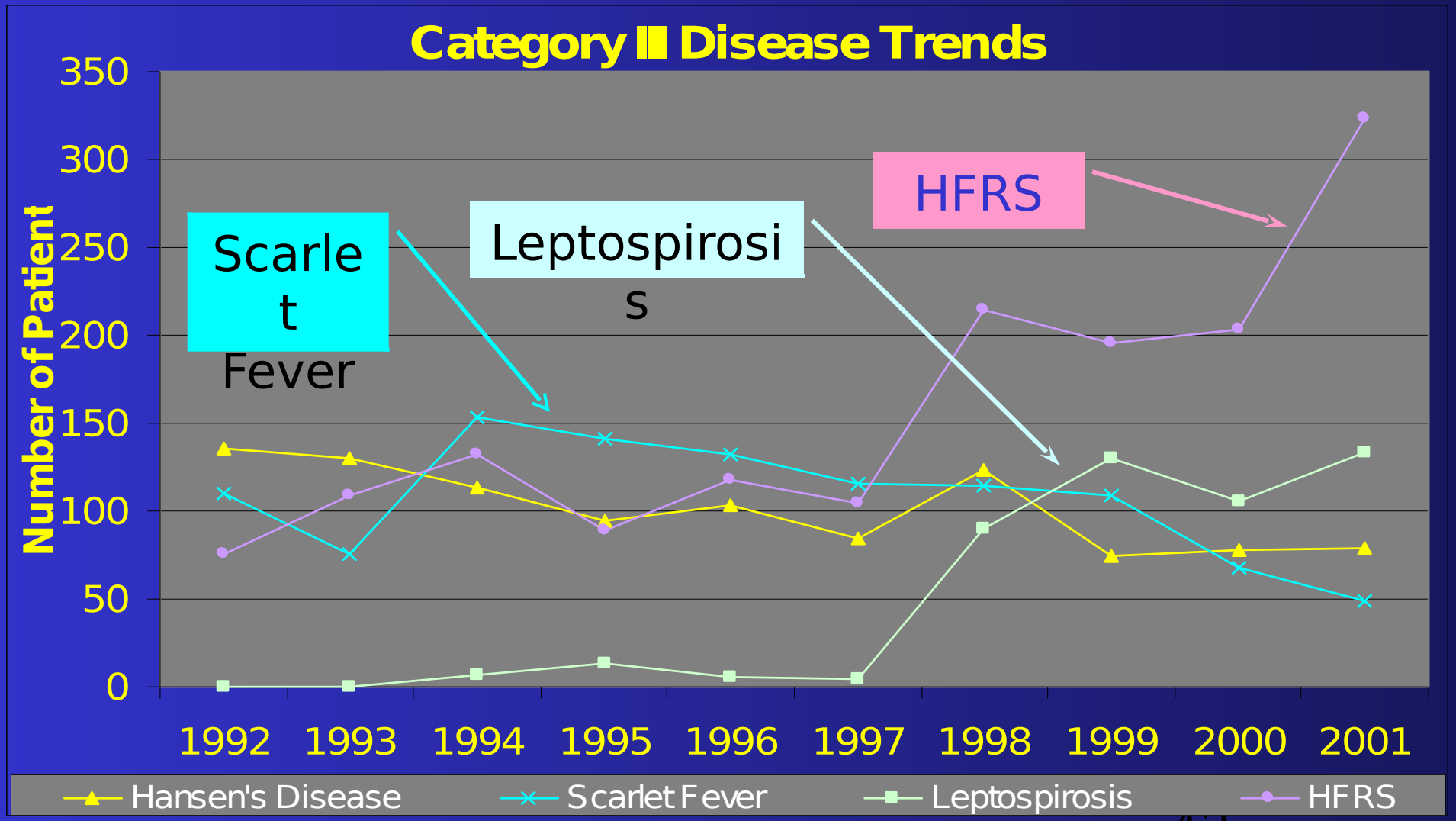
Endemic Diseases in S. Korea (Con't)



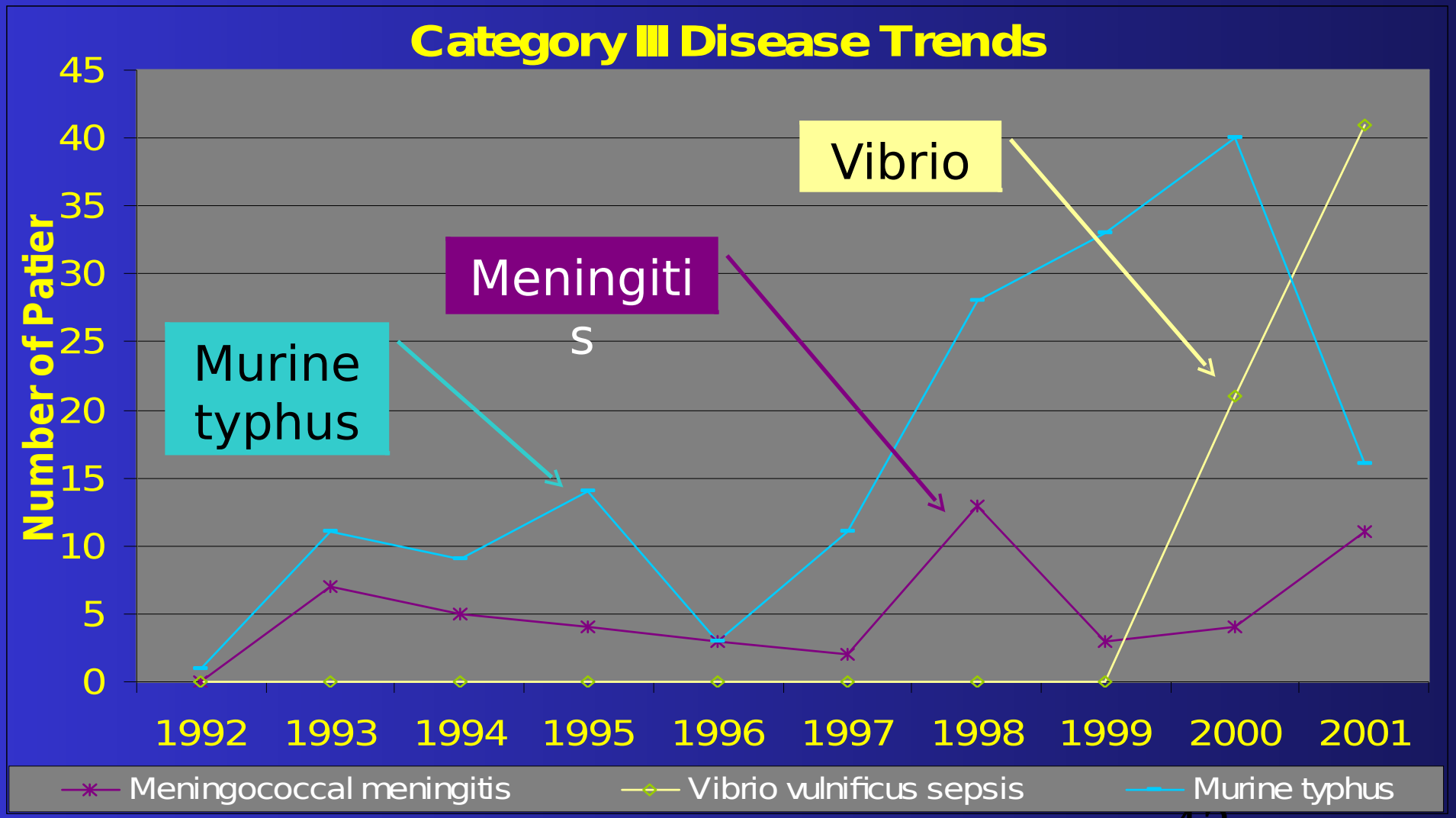
Endemic Diseases in S. Korea (Con't)



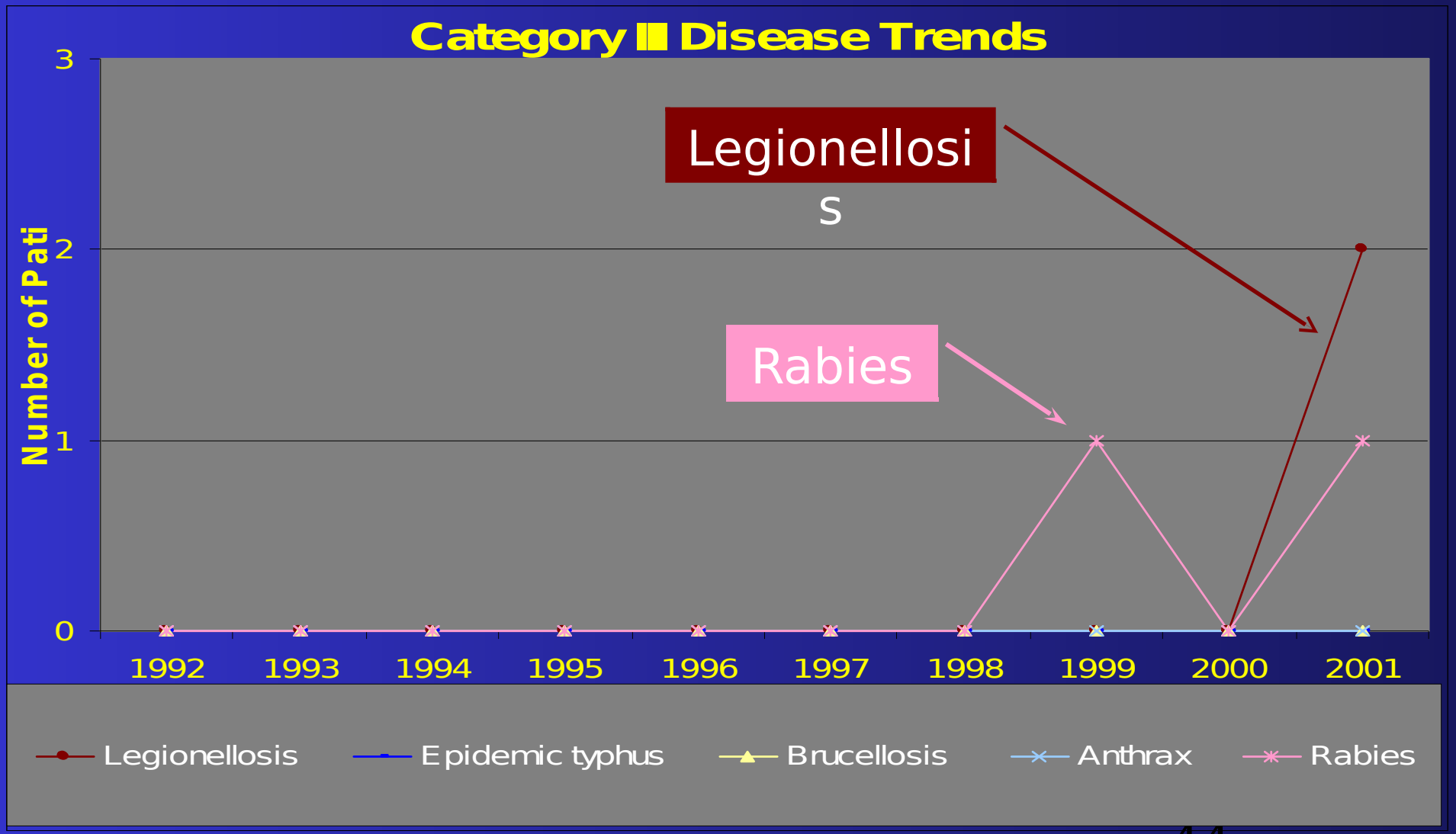
Endemic Diseases in S. Korea (Con't)



Endemic Diseases in S. Korea (Con't)



Endemic Diseases in S. Korea (Con't)



Endemic Diseases in S. Korea

Notifiable Diseases Category IV

- Emerging and imported infectious diseases
- Immediate notification of public health centers
- Immediate reporting to next superior jurisdiction

Endemic Diseases in S. Korea (Con't)

Notifiable Diseases Category IV

- 15 diseases
  - Yellow fever
  - Dengue fever ***
  - Marburg fever
  - Ebola fever
  - Lassa Fever
  - Leishmaniasis
  - Babesiosis
  - Newly Emerging infectious disease
  - African Trypanosomiasis
  - Cryptosporidiosis
  - Schistosomiasis
  - Yaws
  - Pinta
  - Smallpox
  - Botulism

*** All imported cases

Endemic Diseases in S. Korea

Designated diseases

- Designated diseases requiring monitoring of occurrence and outbreak
- Weekly notification to public health centers
- Weekly reporting to next superior jurisdiction

Endemic Diseases in S. Korea (Con't)

Designated diseases

- 9 Diseases
  - Viral hepatitis A *
  - Viral hepatitis C *
  - Chagas disease
  - Angiostrongyliasis
  - Creutzfeldt-Jakob Disease (CJD)
  - VRSA infection (Vancomycin-Resistant *Staphylococus Aureus*) *
  - Gnathostomiasis
  - Filariasis
  - Hydatidosis

* Indicates occurrence within last 10 years

Endemic Diseases in S. Korea

Ranked by Patient Numbers*

1. **TB (27,458)**
2. Measles (7,978)
3. Malaria (2,058)
4. Mumps (1,813)
5. Scrub Typhus (991)
6. Shigellosis (794)
7. Typhoid fever (340)
8. HFRS (173)
9. Rubella (118)
10. Scarlet fever (110)
11. Hansen's disease (94)
12. Leptospirosis (61)
13. Vibrio vulnificus sepsis (31)
14. Cholera (30)
15. Murine typhus (19)
16. Paratyphoid fever (15)
17. Pertussis (14)
18. Enterohemorrhagic *E. coli* (6)
19. Meningococcal meningitis (5)
20. Tetanus (4)

* Average annual number of patients in S. Korea (1994~2001)
Category IV and designated diseases not included due to lack of data

Endemic Diseases in S. Korea

Ranked by Number of Deaths*

1. Hansen's disease (540.5)
2. Tuberculosis (396.8)
3. Vibrio vulnificus sepsis (3.8)
4. HFRS (2.4)
5. Scrub typhus (1.0)
6. Meningococcal meningitis (0.5)
7. Measles (0.9)
8. Leptospirosis (0.6)
9. Rabies (0.3)
9. Typhoid fever (0.3)
11. Japanese Encephalitis (0.1)
11. Enterohemorrhagic *E. coli* (0.1)
11. Tetanus (0.1)
11. Malaria (0.1)

* Average annual fatalities in S. Korea (1994~2001)
Category IV and designated diseases not included due to lack of data

Endemic Diseases in S. Korea

Mortality Rates*

1. Rabies (100.00%)
2. Vibrio vulnificus sepsis (48.39%)
3. Japanese Encephalitis (12.50%)
4. Meningococcal meningitis (8.89%)
5. Enterohemorrhagic *E. coli* (8.33%)
6. Tetanus (3.13%)
7. **Tuberculosis (1.44%)**
8. HFRS (1.38%)
9. Leptospirosis (1.02%)
10. Murine Typhus (0.1%)
11. Typhoid fever (0.07%)
12. Measles (0.01%)
12. Malaria (0.01%)

*Average annual mortality rates in S. Korea (1994~2001)
Category IV and designated diseases not included due to insufficient data

Public Health State

North Korea

- Population
  - 22,224,195 (July 2002 est.)
- Water
  - Treated water supply : 75 % (1993)
  - Daily water supply per person : 150 L
  - Inadequate supplies of potable water
    - Prevalence of Water-borne disease

Public Health State

North Korea

- Pollution
  - Air pollution
    - Burning of poor quality coal
    - Moderated by lack of combustion engine vehicles
  - Water pollution (insufficient sewage system)
  - Untreated industrial discharge
  - Soil erosion and degradation
    - Abandoned mines
    - Massive deforestation of land for fuel

Public Health State

North Korea

- Endemic Diseases
  - Malnutrition
  - Tuberculosis (TB)
  - Acute respiratory infection
  - Malaria and other vector-borne diseases
  - Water-borne diseases
  - Parasites

Endemic Diseases in N. Korea

TB

- Prevalence rate
  - 5%, 1,150,000 people (est.) - a major health problem
  - Upward trend during recent years
- Causes of high prevalence
  - Severe shortage of supplies
    - Anti-TB medicines, diagnostic equipment
  - Untreated or partially treated patients
  - Malnutrition - increased susceptibility to TB

Endemic Diseases in N. Korea (Con't)

TB

- Number of new cases (WHO report)
  - 150~200 per 100,000 population per year (2000)
    (38 per100,000, in early 1990s)
  - About 70% of cases affect the most productive segment of the population (15~54 years)

Endemic Diseases in N. Korea

Malaria

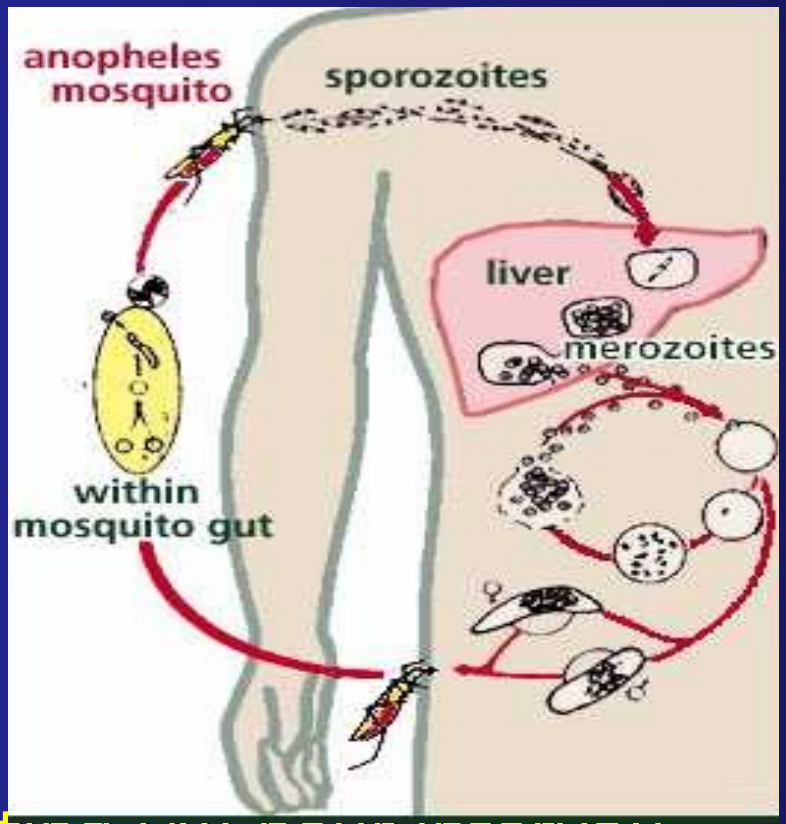
- Re-emergence
  - First reported in 1998 in North Korea (1993 in S. Korea) (probably occurred earlier)
  - *Plasmodium vivax*
- Incidence
  - 2,000 cases were reported in 1998
  - 95,000 cases in 1999
  - The number of cases have increased annually

Militarily Important Diseases

- Vector-borne diseases
  - Highest potential for infection is while training outdoors
- Outbreak history within last 10 years
  - Malaria
  - Korean Hemorrhagic Fever (HFRS)
  - Japanese Encephalitis
  - Diarrheal diseases
  - Scrub typhus, Murine typhus
  - Leptospirosis

Militarily Important Diseases

Malaria

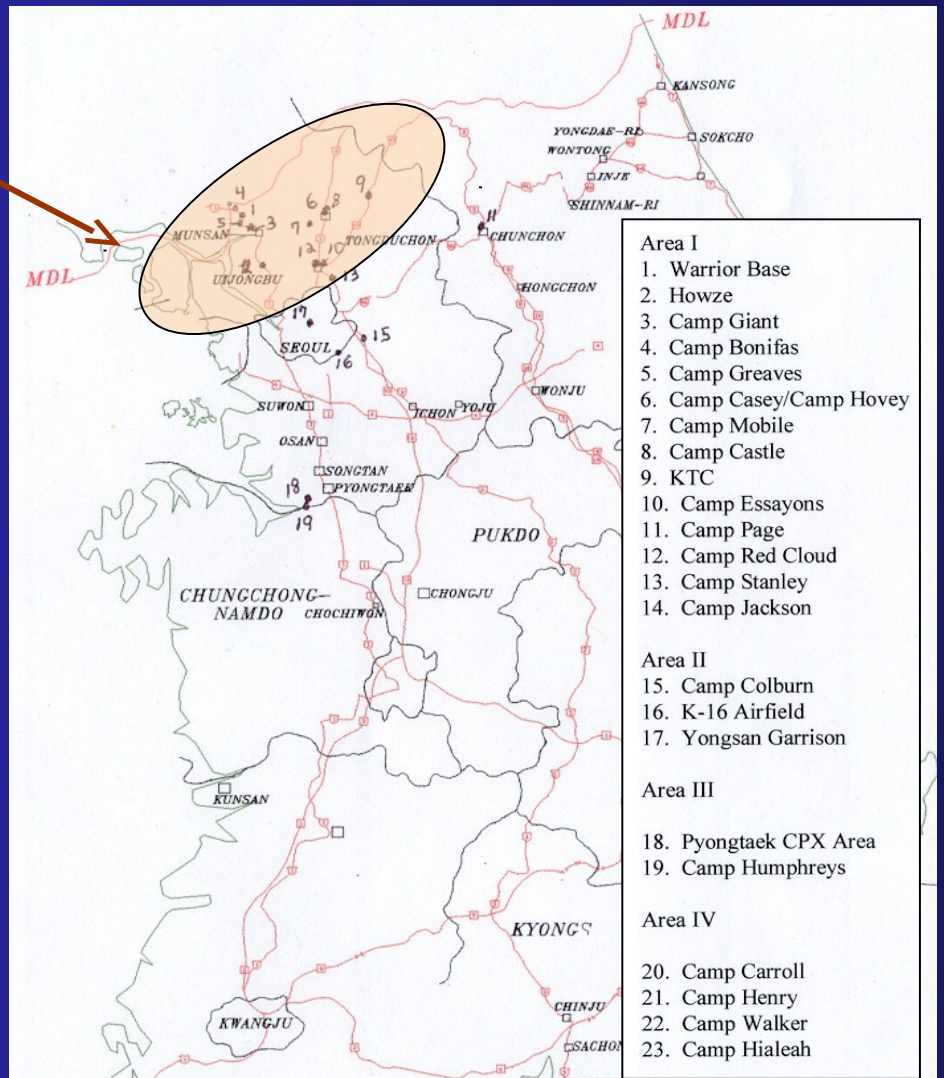


- Etiologic agent
  - *Plasmodium vivax*
- Transmission
  - Nocturnal Mosquito (*Anopheles sinensis*)
- Symptom
  - Flu-like symptoms
  - Periodic fever, chill, sweating (48-hour interval)
- Incubation period
  - 12~20 days or 9~33 months (latent form)

Militarily Important Diseases

Malaria (con't)

- High risk area
  - Along the western edge of the Demilitarized Zone (DMZ)
  - Especially within 10km of the DMZ
  - Cases reported throughout the ROK – Usually exported from the high risk area



Military Important Diseases

Malaria (con't)

Prevention

1) Personal protective measures
   - Insect repellent (DEET)
   - Permethrin treated uniform
   - Wear long pants and long-sleeved shirts rolled down with pant legs tucked inside boots
   - Permethrin treated bed-net
2) Mosquito control
   - Pesticide spray from dusk to dawn
   - Reduce standing water around bivouac site
3) Chemoprophylaxis (anti-malarial drug)

Militarily Important Diseases

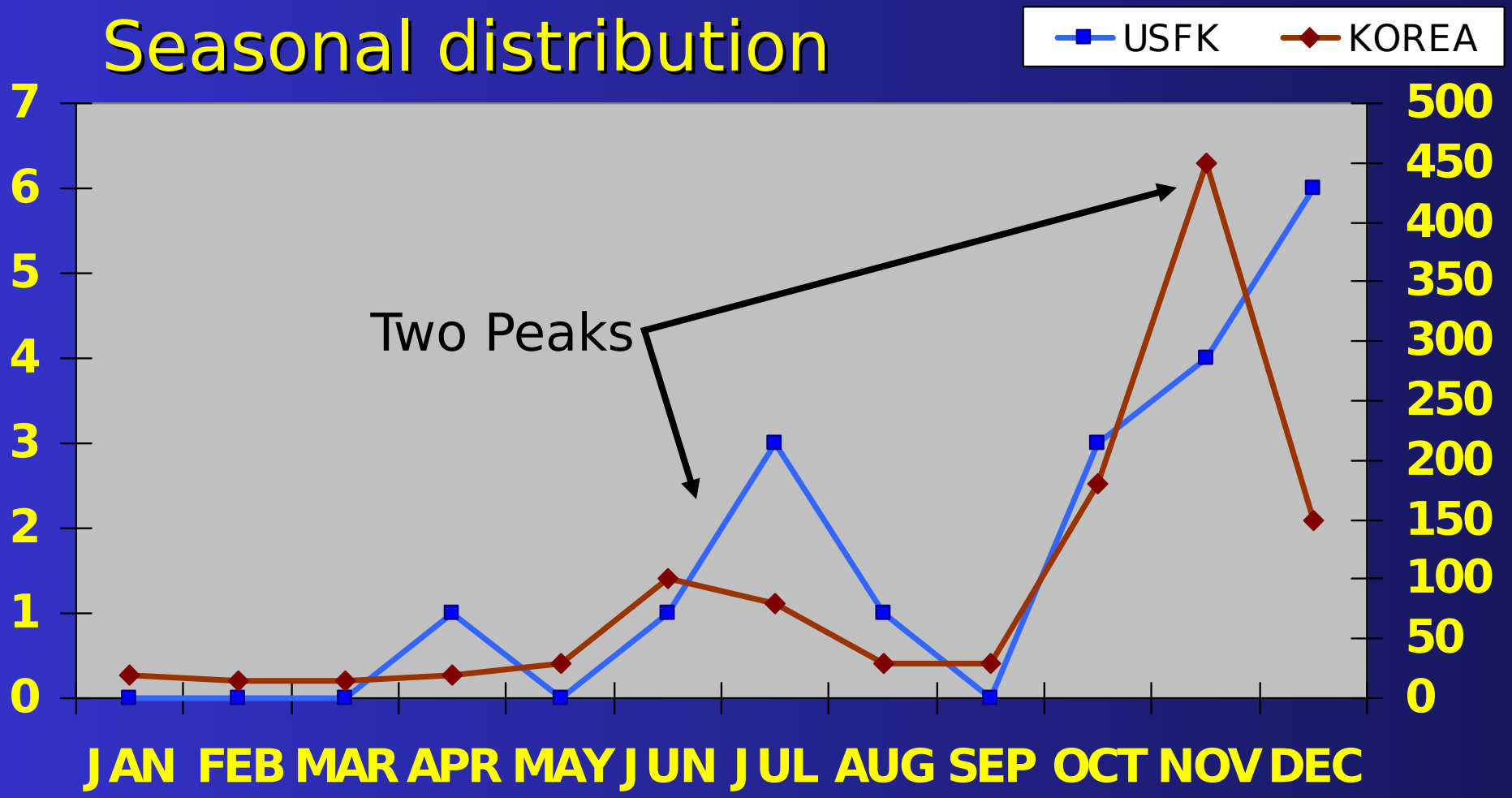
HFRS

- Hemorrhagic Fever with Renal Syndrome
- Etiologic agents
  - Hantaan virus (Korean Hemorrhagic Fever)
  - Seoul virus
- Transmission
  - Aerosolization of Rodent excreta
    - Striped field mouse – Hantaan virus
    - Norwegian rat/house rat – Seoul virus

Militarily Important Diseases

HFRS (con't)

Seasonal distribution



Militarily Important Diseases

HFRS (con't)

- Incubation period
  - Usually 2~4 weeks, but may be a few days to as long as 2 months
- Clinical Signs and symptoms
  - Fever and chills, headache, muscle ache, hemorrhage, nephropathy
- Specific clinical features
  - Flushing of face, neck and chest
  - Blood shot eyes, mouth and throat
  - Tiny rash in soft palate and armpits
  - Triad of severe pain: behind eyes, abdomen, & flank

Militarily Important Diseases

HFRS (con't)

- Prevention
  - Vaccine : Hantavax®
    (Not approved for US personnel)
  - Good field hygiene and sanitation
    - Washing hands
    - Cover trash
    - Properly dispose of trash and food
    - Don't use vegetation for camouflage
    - Avoid rodent infested areas

Militarily Important Diseases

HFRS (con't)

Prevention - Rodents control

- Keep bivouac site clean and cut bushes down
- If possible, set 20m buffer zone from tent to vegetation
- Set rat poison and traps
- Clean traps after each use using disinfectant
- Do not handle rodents and their excreta with bare hands
- Never brush off or vacuum up rodent's dropping, urine and nest (creates aerosolized virus particles)
- Wet down infested areas with bleach/disinfectant to kill the virus and put contaminated material in a hermetically tight container

Militarily Important Diseases

Japanese Encephalitis

- Etiologic agent
  - A member of flavivirus group
- Transmission
  - Nocturnal mosquito, *Culex tritaeniorhynchus*
- Prevailing season
  - Summer (JUL ~ OCT) (peaks in AUG)

Militarily Important Diseases

Japanese Encephalitis (con't)

- Highest endemic area
  - Southern provinces, bordering the coast
- Prevention
  - Personal protective measures
    - Permethrin treated uniform, bed-net
    - Long pants and long-sleeved shirts
    - DEET insect repellent
  - Mosquito control
  - JE vaccine

Militarily Important Diseases

Diarrheal Diseases

- Low endemic levels
- Transmission
  - Fecal → oral
  - Filth fly (mechanical vector)
  - Improper food handling and hand washing
  - Ingestion of contaminated water/food
  - Inadequate water purification

Militarily Important Diseases

Diarrheal Diseases

(con't)

- Bacteria
  - *Aeromonas spp.*
  - *Campylobacter spp.*
  - *Escherichia coli*
  - *Salmonella spp.*
  - *Shigella spp.*
  - *Vibrio parahemolyticus*
  - *Vibrio Cholerae*
- Protozoa
  - *Cryptosporidium spp.*
  - *Entamoeba histolytica*
  - *Giardia lamblia*
- Viruses
  - Rotavirus
  - Enteric adenovirus
  - Astrovirus
  - Small round structured virus

Militarily Important Diseases

Diarrheal Diseases

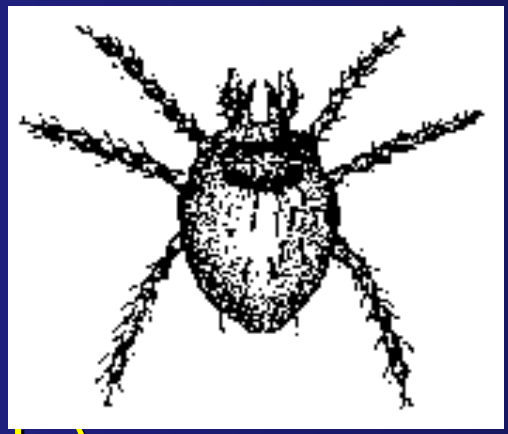
(con't)

Prevention

- Good sanitation and hygiene
  - Proper hand washing
  - Fly control, exclusion and source reduction
    - Eliminate and cover garbage and toilet
    - Insecticide spray
  - Adequate water purification and storage
  - Cook and store food at proper temperature
    - Dangerous temperature zone : 40 ^{o}F ~ 140 ^{o}F

Militarily Important Diseases

Scrub Typhus



- Tsutsugamushi disease
- Etiologic agent (Rickettisia bacteria)
  - *Orientia tsutsugamushi*
- Transmission
  - Bite of larval **chigger mites** (Leptotrombidium)
  - Parasite hosts : Rodents, but will also bite man
- Prevailing season
  - Peak in autumn
    (40% of febrile patients in Korean community)

Militarily Important Diseases

Scrub Typhus (con't)

- Incubation period
  - 10 ~ 12 days
- Signs and symptoms
  - Eschar (bite site)
  - Headache, fever, chill
  - Dull red maculopapular eruption, cough
- Prevention
  - Conduct good personal hygiene and sanitation
  - Vector-reduction (insecticide), Rodent-control
  - Limit exposed skin (pant legs tucked inside boots and sleeves rolled down)

Militarily Important Diseases

Murine Typhus

- Etiologic agent (Rickettisia bacteria)
  - *Rickettsia typhi* (*R. mooseri*)
- Transmission
  - Oriental rat flea (*Xenopsylla cheopis*)+
  - Parasites host : Rodents (normal), cats and dogs
  - Infected flea fecal material rubbed into the skin
- Transmitted year round – Important to do flea control before rodent control to eliminate flea population
- Incubation period
  - 7 ~ 10 days

Militarily Important Diseases

Murine Typhus (Cont')

- Signs and symptoms
  - Headache, backache, arthralgia, abdominal pain
  - Fever (105~106 ◦F)
  - Rash (the trunk → peripherally)
  - Nausea and vomiting in most patients
  - Hacking, dry cough
- Prevention
  - Conduct good personal hygiene and sanitation
  - Vector-reduction (insecticide), Rodent-control
  - Limit exposed skin (pant legs tucked inside boots and long sleeves)

Militarily Important Diseases

Leptospirosis

- Pathogen
  - Bacteria, *Leptospira* spp.
- Transmission
  - Urine of cattle, dogs, rodents and other wild animals
  - Invades the eye, nose and skin abrasions/wounds
- Prevailing season
  - SEP ~ OCT
- Geological distribution
  - Central and western area of the Korean peninsula
    - (Gyeong-gi, Chung-buk, Chon-nam Provinces)

Military Important Diseases

Leptospirosis (con't)

- Incubation periods
  - 7 ~ 10 days
- Signs and symptoms
  - Fever, rigors, myalgias, headache (75 ~ 100%)
  - Dry cough (25 ~ 35 % of cases)
  - Nausea, vomiting, and diarrhea (50% of cases)
- Prevention
  - Avoid contact with animal urine and standing water
  - Wear protective clothing or footwear
  - Doxycycline chemoprophylaxis available

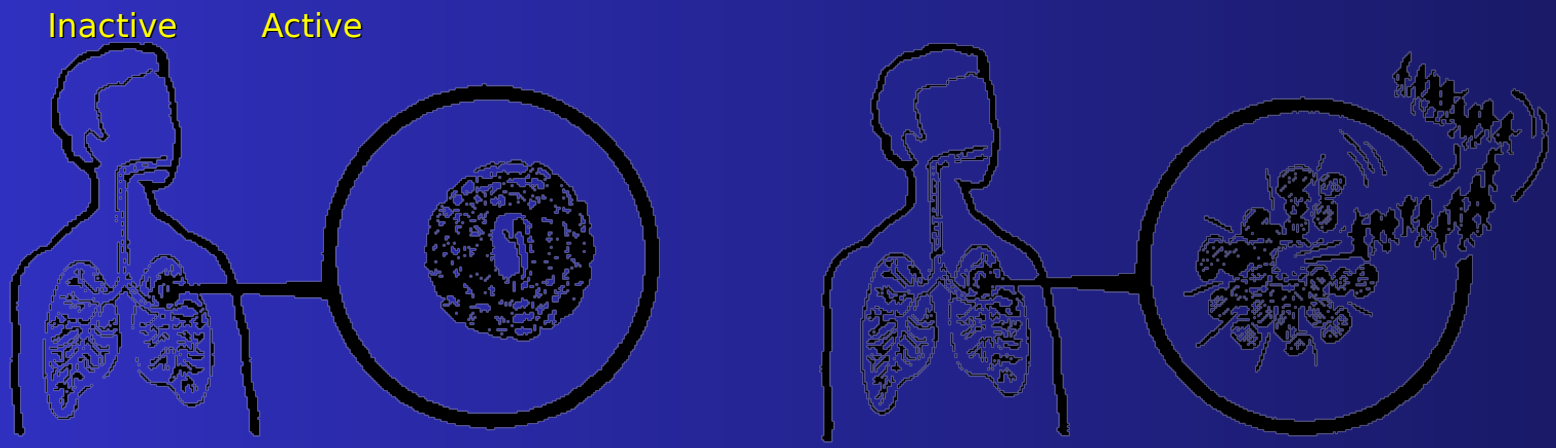
Other Endemic Diseases

- TB
- STDs
- Other Viral Diseases
  - Measles
  - Mumps
  - Rubella

Other Endemic Diseases

Tuberculosis (TB)

- Pathogen
  - Bacteria, *Mycobacterium tuberculosis*
  - Attack the lungs and other parts of the body
  - Is able to remain in an ‘inactive’ state in the lungs
  - May be resistant to multiple anti-tuberculosis drugs



Other Endemic Diseases

Tuberculosis (TB)

(con't)

- Transmission
  - Close contact with people with active TB
  - Bacteria aerosolized during coughing, sneezing or talking

A person may contract pulmonary tuberculosis from inhaling droplets from a cough or sneeze by an infected person
Granuloma in lung tissue
Granulomas from Mycobacterium tuberculosis
A.D.A.M.
A.D.A.M.

Other Endemic Diseases

Tuberculosis (TB)

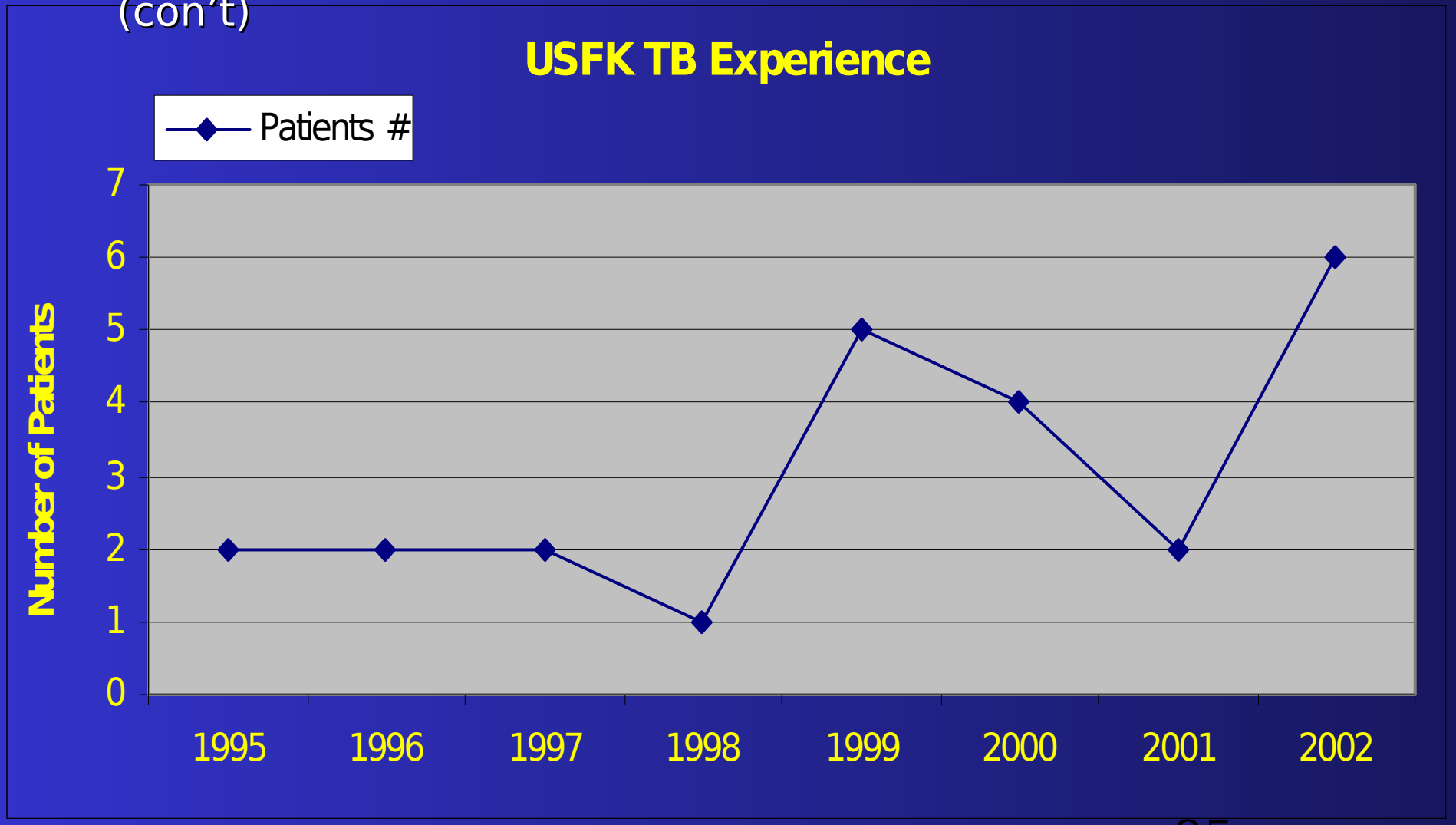
(con't)

- Clinical Signs and Symptoms
  - Continuous cough - Fevers
  - Weight loss - Night sweats
  - Constant tiredness - Loss of appetite
  - Bloody sputum when coughing
- Diagnosis
  - PPD skin test and x-ray examination
- Prevention
  - Annual PPD skin tests
  - Follow-up of close contacts of active TB patients

Other Endemic Diseases

Tuberculosis (TB)

(con't)



Other Endemic Diseases

STD

- Sexually Transmitted Diseases
  - Chlamydia (*Chlamydia trachomatis*)
  - Gonorrhea (*Neisseria gonorrhoeae*)
    - 16 % Penicillin resistance (1996)
  - Herpes Type II (Genital)
  - HIV / AIDS
  - Trichomonas (*Trichomonas vaginalis*)
  - Syphilis

Other Endemic Diseases

STD (con't)

- Prevention
  - Abstinence
  - Mutually monogamous sexual relationship
  - Correct use of condoms
  - Early identification, reporting, and contact tracing

Other Endemic Diseases

Other Viral Diseases

- Measles
- Mumps
- Rubella

MMR (Measles, Mumps,and Rubella): a "3-in-1" vaccine that protects against measles, mumps and rubella.

First shot recommended at 12 to 15 months

Measles

- Pathogen
  - Measles virus
- Transmission
  - Aerosolized droplets
- Clinical signs and symptoms
  - Spreading rash
  - Sore throat, runny nose, cough, muscle pain, fever, bloodshot eyes, white spots on palate, photophobia
- Prevention
  - Immunization to include boosters at 4~6 or 11~12 years

Mumps

- Pathogen
  - Mumps virus (RNA virus)
- Transmission
  - Saliva and respiratory droplets from patients
- Prevailing season : Spring
- Incubation periods : 14~ 24 days

Mumps (con't)

- Clinical signs and symptoms
  - Face pain, Headache, Sore throat ,Fever
  - Swelling of the parotid or salivary glands
  - Swelling of the temples or jaw
- Treatment
  - Symptomatic relief (ice, Tylenol)
- Prevention
  - Immunization
  - Do not share eating utensils

Rubella

- Pathogen
  - Rubella virus
- Transmission
  - Respiratory droplet, direct contact, vertical infection
- Clinical signs and symptoms
  - Low-grade fever (102°F or lower), rash, bloodshot eyes
  - Headache, runny nose, muscle or joint pain, malaise
- Prevention
  - Immunization

Pests and Vectors

- Biting flies
  - Mosquitoes, black files, horse files, biting midges
- House files and other filth flies
- Cockroaches
- Body, head and pubic lice
- Fleas, mites (*Leptotrombidium* spp.)
- Venomous arthropods
  - bees, hornets, wasps, urticating caterpillars and spiders
- Ticks

Pests and Vectors (con't)

- Biting flies
  - Mosquitoes
    - Over 60 species in Korea
    - Malaria, Japanese encephalitis
    - Mosquito control, Personal protective measures
  - Bees, hornets and wasps
    - 19 species in Korea
    - Abundant during the summer months
    - Similar to species found in the U.S.
    - Use of repellents or site relocation

Pests and Vectors (con't)

- House files and other filth flies
  - Mechanical vector of diarrheal diseases
  - Area sanitation
  - Indoor sprays / light traps, outdoor flytraps
  - Screens and air curtains, etc.

Pests and Vectors (con't)

- Cockroaches
  - Mechanical vector of food-borne diseases
  - Good sanitation practice and pest control
- Body, head and pubic lice
  - Epidemic typhus (body lice)
  - Insecticide shampoos, boiling clothes, treatment of clothes with permethrin
- Fleas
  - Skin irritation and murine typhus
  - Rodent host infects fleas that feed on alternate human hosts and transmit pathogens in their feces

Pests and Vectors (con't)

- Mites (*Leptotrombidium* spp.)
  - Scrub typhus
  - Grassy areas and areas of secondary growth where vegetation has been disturbed
  - Proper wear of uniforms and use of repellents and permethrin treated uniforms
  - Avoidance of grassy habitats and sleeping and resting directly on the ground

Pests and Vectors (con't)

- Ticks
  - Vector of numerous diseases, i.e., ehrlichiosis, Lyme disease, and tick-borne encephalitis
  - Remove carefully with a fine forceps, being careful to not break mouthparts off from the tick – may result in a secondary infection
  - Put removed live ticks in airtight container and ship to the Preventive Services Directorate, 18th MEDCOM, for analysis

Pests and Vectors (con't)

- Moths
  - Caterpillars of several species have sharp urticating hairs and spines that contain venom
  - Avoid caterpillars with long hairs or spines

Pests and Vectors (con't)

- Centipedes
  - Toxic and painful bites
- Spiders
  - 3 species can cause painful bites
  - All spiders entering houses seek refuge, often among boxes or clothes laying on the floor
  - Cleanliness is on method of reducing household spider populations

Prevention Against Insects

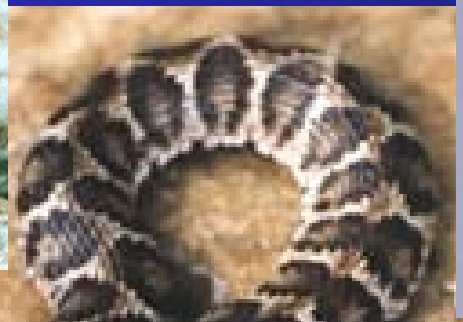
- Use repellent
- Use permethrin treated uniform
- Proper wear of the uniform
  - Long sleeve shirts and pants
  - Pant legs tucked into boots
- Use permethrin treated bed net
- Sleep elevated off the floor
- Check clothing and boots before dressing
- Shake bedding before entering
- Use “buddy inspection” for ticks

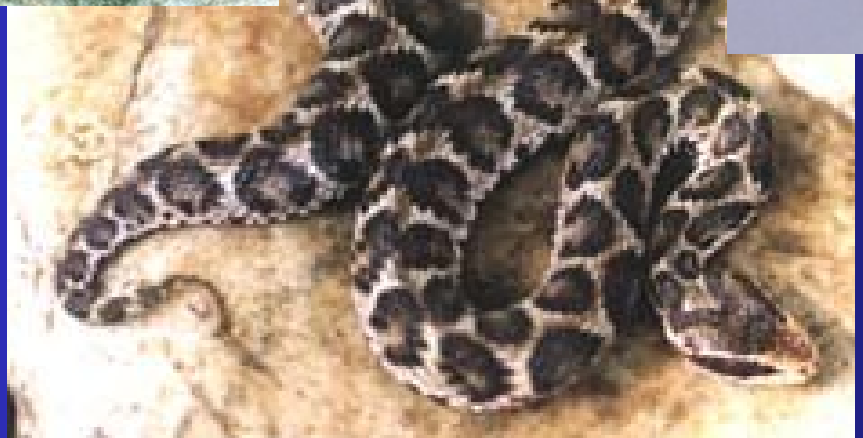
Hazardous Animals

- Snakes
  - Only 3 species are venomous
  - Same precaution to avoid snakebites taken in the U.S. should be taken in Korea
- Rodents
  - Major rodents in the field
    - Norway rat, Roof rat, House mouse, Striped field mouse

Hazardous Animals

Venomous Snakes





Hazardous Animals

Venomous Bites Prevention

- Avoid contact with snakes (inoffensive in most case)
- Shake boots and clothes before dressing
- Do not allow troops to walk barefoot, sleep on the ground or put hands into holes
- Prohibit keeping snakes, spiders or other native animals as pets
- Use caution when picking up items lying in grass or other vegetation
- Handle dead snakes with great caution, they are not always dead and a scratch with the fangs can inject venom

Hazardous Animals

Rodents

- Reservoirs of several diseases
  - Korean Hemorrhagic Fever
  - Leptospirosis
  - Murine typhus
  - Rickettsial pox

Hazardous Animals

Rodents (con't)

- Rodent detection
  - Droppings, Burrows, Odor, Runways
  - Rub marks
    - Oil from their fur that accumulates on surfaces along primary paths
  - Gnawing (teeth marks)
  - Tracks (often seen in powders, ie. flour)
  - Presence of dead rodents

Hazardous Animals

Rodents (con't)

- Rodent control
  - Keep bivouac site clean and cut bush
  - If possible, set 20m buffer zone from tent to vegetation
  - Set rat poison and traps
  - Clean traps after each use using disinfectant
  - Do not handle rodents and its excreta with bare hands
  - Never brush off or vacuum up rodent's dropping, urine and nest and put it in hermetically tight container
  - Wet down infested areas with bleach/disinfectant to kill the virus to prevent the virus from aerosolizing

Other Animal Associated Diseases

Rabies

- Fatal acute viral infection
- Incubation perio
  - 10 days ~ 7 yrs
  - average 3 ~ 7 w
- Specific signs
  - Hyperesthesia
  - Hydrophobia
  - Photophobia

Other Animal Associated Diseases

Rabies (con't)

- Signs and symptoms
  - low-grade fever (102 °F or lower)
  - exaggerated sensation at the bite site
  - loss of feeling in an area of the body
  - anxiety, stress, and tension
  - positive Babinski's reflex
  - pain at the site of the bite
  - numbness and tingling
  - loss of muscle function
  - drooling
  - muscle spasms
  - swallowing difficulty
  - restlessness
  - convulsions
  - excitability

Other Animal Associated Diseases

Rabies (con't)

- Prophylactic treatment
  - Clean the wound well with soap and water and seek medical care
  - Try to gather as much information about the animal as possible
  - Immunization with rabies vaccine
- Prevention
  - Vaccination of dogs and cats every 2 years
  - Avoid contact with stray domestic animals and feral animals
  - Consider all cats in Korea to be feral

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